Atlantic Richfield Company

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March 13, 2015

Lynda Deschambault
Remedial Project Manager
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street (SFD 7-2)
San Francisco, California 94105

Subject: **Response to U.S. EPA Comments on the Proposed Remedial Investigation/Feasibility Study Schedule**
Leviathan Mine Site
Alpine County, California

Dear Ms. Deschambault:

Atlantic Richfield Company (Atlantic Richfield) has prepared this letter in response to your letter of January 15, 2015 providing comments on the Proposed Remedial Investigation/Feasibility Study (RI/FS) Schedule dated December 12, 2014. Our December 12, 2014 letter was prepared in response to your request for a summary Table of Contents (TOC) for the Remedial Investigation/Feasibility Study (RI/FS) document and an approximate schedule for estimated RI/FS completion. Atlantic Richfield agrees with the U.S. Environmental Protection Agency (U.S. EPA) that we should continue to develop and optimize strategies and approaches intended to ensure the timely and cost-effective completion of the RI/FS. We look forward to continued collaboration with the U.S. EPA toward this objective.

Your letter expresses concern about the amount of time that has been spent already collecting RI information pursuant to the 2008 Administrative Order and the amount of time still being proposed for completing the RI/FS. We share that concern, but there are numerous reasons – many of them outside of Atlantic Richfield's control – why some of the scheduling projections first set forth in 2009 have not been fully achieved. Even so, there has been substantial progress to date.

We have considered the concepts outlined in your January 15, 2015 letter for shortening the schedule for the completion of the RI/FS. While we agree that the proposed schedule for the sequence of and intervals between RI/FS activities and deliverables laid out in Atlantic Richfield's 2009 planning documents generally still works, we don't necessarily agree with the way the U.S. EPA is characterizing that schedule, as discussed further below. As requested, we have modified our conceptual planning schedule for the completion of the RI/FS as presented in Attachment A to this letter. We believe this conceptual schedule is an important tool for understanding and managing the prioritization and sequencing of upcoming work activities. In order to achieve the key milestones shown on the conceptual schedule, Atlantic

Richfield is looking for consensus with the U.S. EPA on the prioritization of various work activities and the timing for their implementation. We also need to be identifying tasks for which the U.S. EPA and Atlantic Richfield can agree that sufficient data collection and analysis have been completed to support remedial action decision making, thus allowing Atlantic Richfield to focus its future investigation efforts on areas where data gaps remain.

One such priority relates to the National Historic Preservation Act (NHPA). Atlantic Richfield and EPA began discussing a NHPA Programmatic Agreement (PA) in the fall of 2012. Those discussions were deferred in lieu of Section 106 consultation, (as was recommended by the U.S. EPA Remedial Project Manager), which was completed in September 2014. The existing NHPA concurrence decisions allow for the completion of most, but unfortunately not all, future RI sampling work. To ensure the completion of the remaining RI field work, Atlantic Richfield requests that the U.S. EPA either complete the PA or develop an efficient process for revising the existing Area of Potential Effect (APE) to include additional reference areas that will need to be sampled but were not included in the original APE. At the time the APE was delimited for the purpose of the 106 Consultation, not all reference areas were determined, and it was envisioned that a PA would be executed to address any additional areas needed for reference sampling. Upcoming reference area sampling activities are likely to include investigations in areas outside of those surveyed for the 106 consultation. Without a PA, completion of this work will require additional archaeological surveys and a Section 106 consultation, which will result in additional schedule delays that Atlantic Richfield cannot control.

Another concept that we feel is important for achieving the key schedule milestones is improving the process for preliminary data analysis and collaboration on sampling plan development between our technical representatives. As we discussed in our January 21, 2015 technical meeting and described below, we believe that it will be mutually beneficial to the U.S. EPA and Atlantic Richfield to develop a collaborative data review process that will allow for the timely review of Focused Remedial Investigation (FRI) data and interactive decision making during the implementation of the RI/FS.

Our responses to the U.S. EPA's January 15, 2015 comments are provided below with your comments restated in italics.

Comment G1: Sampling in 2015: *EPA believes that focused attention to planning within the first quarter or by April 1, 2015 will provide an opportunity for a more robust sampling schedule this year. The shortened schedule is based on the observation that planning for the On Property stream sediment sampling and On and Off Property floodplain soil sampling is nearly completed; that a small number of monitoring and reference wells remain to be installed and sampled; and that input from the Washoe Tribe of Nevada and California ("Washoe") regarding resources to be sampled has been received. To realize a shortened schedule, please focus the winter planning efforts (next three months) on:*

- *completion of the stream sediment and floodplain soil sampling work plan amendments and associated task specific sampling plans;*

- *completion of the next draft of the Eco Risk Assessment Workplan;*
- *incorporation of the Washoe input regarding receptor species and biota sampling;*
- *completion of the Reference FRI work plan.*

Completing these planning efforts within the first quarter, or by April 1, 2015, will allow for the completion of the associated field work during the 2015 field season. This would shorten Atlantic Richfield's proposed RI schedule by at least one year. In addition to the ongoing monitoring data collected during the 2015 field season, data that will be available by the end of the 2015 sampling season to support the risk assessments and the FS will include: surface water, groundwater, and mine waste data; biota (plants and fish); stream sediment (On and Off Property) and flood plain soil (On and Off Property); and reference data.

Response: Atlantic Richfield has been working diligently to complete the necessary planning documents to allow for the implementation of a number of sampling activities in the 2015 field season. Specifically, the status of the four items listed above is as follows:

- Work plan amendments and associated task specific sampling plans for stream and floodplain soil sampling have been reviewed by the U.S. EPA. An updated version of On-Property FRI Amendment No. 8 – *Detailed Stream Sediment and Floodplain Soil Investigations*, revised to address U.S. EPA comments, will be submitted on March 13, 2015. An updated version of Amendment No. 10 - *Stream Sediment and Floodplain Soil Characterization in Beaver Dam and Pond Complex in the On-Property Reach of Leviathan Creek*, which was conditionally approved by the U.S. EPA, will be submitted on March 20, 2015. Sediment sampling in the East Fork Carson River and portions of the Downstream Study Area have already been completed.
- A Draft Final version of the Ecological Risk Assessment Work Plan was submitted to the U.S. EPA on February 20, 2015. The multiple sampling efforts needed to provide the data that will be used in the Ecological Risk Assessment are well underway.
- Atlantic Richfield has or is in the process of incorporating Washoe Tribe input regarding receptor species and biota sampling in its data quality objectives, risk assessment work plans, and other FRI work plan amendments. We are currently working collaboratively with the U.S. EPA and Washoe Tribe representatives since our meeting on January 21, 2015 to address comments on receptor species and plant sampling. We anticipate that the U.S. EPA will resolve any outstanding issues with the Washoe Tribe by April 1, 2015.
- A Draft Final version of the Reference Area FRI Work Plan was submitted to the U.S. EPA on February 28, 2015.

As the result of the significant progress that the U.S. EPA and Atlantic Richfield have achieved over the past several months relative to 2015 work planning and the resolution of issues related to NHPA compliance, we anticipate significant progress with the implementation of FRI sampling activities during the 2015 field season.

Comment G2: Technical Meetings to Focus on Data Usability: *Technical meetings in the first and second quarter of 2015 should focus on review and data usability of current data and data collected in 2015. This will allow for the initiation of the risk assessments in mid-2015; 8 months earlier than anticipated in the proposed September 12, 2014 schedule. This would also help to mitigate concerns that surface, groundwater, fish tissue, and Off Property stream sediment data collected to date may no longer represent site conditions if Atlantic Richfield's September 12, proposed schedule is adhered to.*

Response: As discussed in the January 21, 2015 technical meeting, Atlantic Richfield agrees that the ongoing collaborative review of existing data and additional data collected during FRI implementation is the most effective means to facilitate decision making regarding data adequacy and usability. In would be premature and inefficient to begin risk assessments with datasets that are still under development and without the availability of reference concentrations. Ideally, the risk assessment calculations would be done once data sets are complete and exposure point concentrations are agreed upon. The data sets would be considered complete when quality assurance/quality control review is complete, data has been visualized on figures, data gaps have been identified and filled, and representative data are agreed upon (current RI/FS vs. historic data). However, we believe the collaborative review of some of the existing datasets (e.g., groundwater) and certain preliminary risk assessment tasks can begin in 2015 in conjunction with the collection of reference area data.

As discussed in our January 21, 2015 technical meeting, we believe that it will be mutually beneficial to develop a collaborative data review process that will allow for the timely presentation, interactive review, and decision making without the preparation of voluminous interim data submittals that require significant time to prepare and then revise to address U.S. EPA comments. In lieu of a process requiring formal technical report submittals and formal written comments from the U.S. EPA followed by written responses and report revisions, we suggest consideration be given to an alternative data review process. One concept for an alternative data review process that was discussed included the preparation of short technical memoranda followed by presentation and discussion of sampling results in technical meetings. These technical memoranda would consist of 10 to 20 pages of text and supporting tables and figures and would provide U.S. EPA representatives an opportunity to review data prior to a subsequent technical meeting or workshop. The technical meeting or workshop would consist of collaborative review of data and discussion of sampling results including interactive decision making regarding next steps. Decisions made regarding the need for additional sampling and/or the adequacy of datasets made in the technical meetings would then be documented in meeting minutes.

Comment G3: Risk Assessment Included in the Remedial Investigation: *Atlantic Richfield's proposal includes a statement that "the RI Report will be prepared separately from the Baseline Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) reports" and that "this will allow for U.S. EPA review of the RI Report prior to the submittal of the Baseline HHRA and ERA to limit revisions to these two documents." The 2009 RI schedule provided for a Draft RI Report to be submitted one month after sampling was complete, with the HHRA and ERA submissions due six months later. EPA is willing to continue with this approach,*

with the understanding that ultimately, developing and conducting an RI/FS generally includes risk assessments. Atlantic Richfield should continue to develop the two risk assessments (ERA and HHRA) in parallel, for inclusion in the final RI Report. The Table of Contents and timeline should be adjusted accordingly. Please add the HHRA and ERA into the table of contents. Please note, it is not uncommon (and acceptable to EPA) to add them as a separate Appendix to the final RI Report.

Response: We assume the U.S. EPA is referring to the conceptual schedule submitted with Addendum #1 to the Draft Program Work Plan dated November 16, 2009. As indicated in the November 16, 2009 Addendum, the schedule was intended for planning purposes and was conditioned on general assumptions made at the time it was prepared. Please see the following excerpt from the November 16, 2009 Addendum.

> *"A revised schedule that identifies dates and deliverables for the RI/FS activities identified in the work plan is attached. The schedule begins in fourth quarter 2009 and projects RI/FS activities on a quarterly basis through 2014. The schedule includes a plan for submittal and EPA review and approval of the additional FRI work plans in early 2010. If EPA approval takes longer than projected, the implementation schedule for the FRI work will be delayed perhaps significantly due to the sequential development of certain tasks and seasonal sampling needs. Very general assumptions were used in sequencing the RI/FS work over the projected three-year time period. As the FRI work plans have not been completed or approved, this projection is speculative, and Atlantic Richfield assumes this schedule will be used primarily for planning purposes."*

The 2009 schedule did not actually provide for submittal of the Draft RI Report one month after the completion of all RI sampling. Rather, the schedule shows that ongoing monthly groundwater monitoring activities (Task ID 21 and 36 on the 2009 Schedule) would continue during preparation of and through the month prior to submission of the RI, HHRA, ERA, and FS Reports. According to the 2009 schedule, the discrete sampling and analysis activities that would be used in preparing the RI Report were to be completed more than 15 months prior to the RI Report submittal date. This makes sense, given the amount of time required to compile, validate, analyze, and report such a large amount of information.

Subject to these clarifications, Atlantic Richfield agrees that the conceptual sequence of the RI/FS submittals outlined in the 2009 schedule is generally still appropriate. This sequence consisted of the submittal of the Draft RI report approximately 15 months after the completion of data collection followed by the submittal of the Draft HHRA and ERA reports approximately six months thereafter. The Draft FS Report was to be completed six months after the completion of the HHRA and the ERA Report or about 1 year after the submittal of the Draft RI Report.

Comment G4: Iterative Approach to the Risk Assessments: *Preliminary remedial action objectives and associated goals from screening level risk assessments should be used to support technology evaluations in the FS. Media specific screening level risk evaluations will expedite conclusions regarding contaminants of concern as opposed to contaminants of*

potential concern prior to conducting the cumulative risk assessment for all media and exposure scenarios.

Response: Atlantic Richfield supports the use of media-specific screening-level risk evaluations to expedite decision making prior to the completion of the Baseline Human Health and Ecological Risk Evaluations. As described in our response to Comment G2 above, we believe that the collaborative review of data and related decision making can occur in technical meetings. Screening-level risk evaluations should be integrated into this collaborative data review process along with comparisons to applicable media-specific reference concentrations, as soon as they are available.

In addition, the Table of Contents for the RI component of the RI/FS Report has been expanded to include comparisons of datasets to screening levels for various applicable media. As discussed in our January 21, 2015 meeting, it will be important for Atlantic Richfield and the U.S. EPA to reach early consensus on appropriate screening levels for decision making during implementation of the RI/FS. The conceptual site models previously developed for human health and ecological risk assessment and the current and reasonably anticipated future land use for the different portions of the site will need to be properly accounted for in this process.

Comment G5: Integration of RI and FS: *Timely completion of RI field investigations and risk assessments would also support completion of the FS on a shorter time-frame. Developing and conducting a combined final RI/FS generally includes treatability studies and analysis of alternatives. EPA expects that completing evaluations and white papers concerning mine waste, in-situ mineralized sources, groundwater, and surface water could be achieved within a comparatively short period of time using information and data developed up to and through the 2014 field season. Evaluations of stream sediment and floodplain soil response could then begin shortly after assessment of data collected during the 2015 field season. Additional data gaps and RI sampling could be completed during the early field sampling season in 2016. The 2009 schedule required submittal of a Draft RI Report by December 31, 2013, one month after completion of sampling. Maintaining this sequence of submittals, receipt of final sampling results in November 2016 should be followed by submittal of the Draft RI Report by December 31, 2016, by the HHRA and ERA by July 1, 2017, and the combined concurrent completion of both an RI and FS report for submittal at the same time by December 31, 2017. (EPA is completing review of Atlantic Richfield's FS approach submitted on August 27, 2014, and will provide comments under separate cover.) EPA asks that Atlantic Richfield continue to develop the feasibility study in parallel, for inclusion in a final RI/FS Report. The Table of Contents and timeline should be adjusted accordingly. Please add the FS and associated sections into the Table of Contents.*

Response: Atlantic Richfield agrees that the preparation of the FS component of the RI/FS Report can be integrated with preparation of the RI and baseline risk assessment components of the RI/FS Report. While we agree that the data collected up to and through the 2014 field season will be highly useful for certain FS evaluations and white papers, we do not believe it is fully adequate to complete those analyses. As described in our response to Comment G3 above, we believe it is reasonable to assume that the Draft FS Report be completed six months

after the completion of the HHRA and the ERA Report or about 1 year after the submittal of the Draft RI Report. We will submit responses to your comments on the FS Approach provided in your January 15, 2015 letter under separate cover.

As described above in our response to Comment G3 above, the 2009 schedule did not contemplate submittal of the Draft RI Report one month after the completion of RI sampling. Rather, the 2009 schedule allowed for 15 months between the completion of RI data collection and report submittal. It would have been, and still is, unreasonable to assume that the Draft RI Report could be submitted only one month after the completion of sampling activities. Laboratory analyses, data validation, and subsequent data usability evaluations and other interpretative analyses will require at least 12 months following the completion of sampling activities. Consequently, it is unreasonable to assume that the Draft RI Report could be submitted by December 31, 2016 unless all data collection activities are completed during the 2015 field season. Given the considerable amount of sampling activities remaining to be completed, we believe it more reasonable to assume that the majority of sampling activities would be completed by the end of the 2016 field season and the Draft RI Report would be completed by the end of 2017 consistent with our December 12, 2014 letter.

Comment G6: Gantt Chart for Revised RI/FS Schedule: *Please provide a revised schedule allowing direct comparison of the RI and FS timelines. Please include a Gantt Chart, which is useful to allow visual comparison between timelines for the various tasks such as timing of field work with respect to the risk assessments and timing of risk assessments with respect to the FS and delivery of the RI/FS Report.*

Response: Atlantic Richfield has prepared the attached Gantt chart illustrating the conceptual schedule for the completion of various components of the RI/FS Report (Attachment A). The conceptual schedule illustrates the sequence of activities related to the anticipated completion of various sampling activities in the On-Property, Off-Property, and Reference study areas, laboratory analysis, data validation, data evaluation, and preparation of the RI, HHRA, ERA, and FS components of the RI/FS Report. It also shows that many sampling activities are already complete. This conceptual schedule assumes that a number of priority work activities will be approved by the U.S. EPA and completed in 2015 and other activities (especially ones that do not require data collection over more than one sampling season) are deferred to 2016. Other scheduling assumptions are summarized in Attachment A for your reference.

Comment G7: Addressing Data Gaps: *In Atlantic Richfield's proposed schedule, there are several references to the need for "FS data gap collection." EPA believes that these gaps can be analyzed as the RI and FS are concurrently developed and data is collected. Once a remedy is selected, additional information pertinent to remedy design can be collected during Remedial Design Investigation (RDI).*

Response: The term "FS Data Gap Study" refers to studies that generate additional site specific information outside the RI scope that is needed to evaluate remedial alternatives in the FS. In addition, Remedial Design Investigations are typically performed at such time that the range of remedial alternatives has been narrowed or a preferred remedial alternative has been

selected. Atlantic Richfield concurs with the U.S. EPA that FS data gap collection activities can occur concurrently with other RI sampling activities, and some may conceivably be delayed until the RDI phase. In order for these FS data collection activities to occur concurrently with the implementation of the RI and FS, it will be necessary to develop a collaborative data review process as described in our response to Comment G2 above.

Comment G8: Annotated Table of Contents: *EPA appreciates receipt of the Table of Contents. In addition to the changes noted above, to ensure that all the various work plans and their associated data submissions are included, along with additional analysis and interpretation, please provide a revised annotated Table of Contents for the RI/FS Report that identifies which of the various FRI work plans and associated addendums/amendments will support each section as outlined. Please include a paragraph under each heading and subheading to describe what information will be included in each section.*

Response: Annotated draft Tables of Content for the RI, HHRA, ERA, and FS components of the RI/FS Report are attached to this letter. The RI, HHRA, ERA, and FS components of the RI/FS Report are designated as Volume 1 through Volume 4, respectively. The previously submitted Tables of Content for the RI component (Volume 1) of the RI/FS has been updated to include the annotations requested by the U.S. EPA, including a summary of the contents of each section and subsection. The Tables of Content for the HHRA, ERA, and FS components of the RI/FS are newly developed and have been annotated for consistency with the RI component (Volume 1). Note that Section 5.0 of the RI Table of Content describes the scope of various FRI activities for each study area and media. This section includes annotations identifying work plans and associated addenda/amendments for various FRI sampling activities as requested.

If you have any questions or comments, please feel free to contact me at (714) 228-6770 or anthony.brown@bp.com.

Sincerely,

Anthony R. Brown
Project Manager, Mining

Attachments:

Attachment A – Priority Work Activities for 2015, Key Assumptions for RI/FS Schedule, and Updated Conceptual RI/FS Schedule
Attachment B – Annotated Table of Content for Remedial Investigation, Volume 1
Attachment C – Annotated Table of Content for Human Health Risk Assessment, Volume 2
Attachment D – Annotated Table of Content for Ecological Risk Assessment, Volume 3
Attachment E – Annotated Table of Content for Feasibility Study, Volume 4

cc: Gary Riley, U.S. Environmental Protection Agency, Region 9 – via electronic
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ATTACHMENT A

Priority Work Activities for 2015, Key Assumptions for RI/FS Schedule, and Updated Conceptual RI/FS Schedule

ATTACHMENT A
PRIORITY WORK ACTIVITIES FOR 2015, KEY ASSUMPTIONS FOR RI/FS SCHEDULE, AND UPDATED CONCEPTUAL RI/FS SCHEDULE
Leviathan Mine Site
Alpine County, California

This attachment presents a conceptual schedule of tasks for completion of the RI/FS at the Leviathan Mine site as presented in the attached generalized Gantt chart format. This schedule was developed for the purpose of project planning in consideration of the status of various completed and yet-to-be completed RI/FS activities. At this time, it is not possible to identify definitive completion dates for all scheduled tasks, given that considerable data remain to be collected for completion of the RI component of the RI/FS, and there are many factors beyond our control that influence work progress. At a minimum, the following priority work activities will need to be completed in 2015, and the key assumptions described below will need to be satisfied, in order to meet the projected schedule milestones shown on the attached conceptual RI/FS schedule. Other RI/FS tasks – primarily those not requiring more than a single season of data collection – will be deferred until 2016.

1.0 PRIORITY WORK ACTIVITIES FOR 2015

The following priority work activities will need to be completed in 2015 in order to achieve key schedule milestones shown on the attached conceptual RI/FS schedule.

1.1 DOCUMENTS AND WORK PLANS

Documents and work plans that are a priority for completion and/or U.S. EPA approval in 2015 are as follows:

1. National Historic Preservation Act – The Cultural Resources Evaluation Report submitted to the U.S. EPA on March 13, 2014 was intended to help facilitate a Section 106 Consultation, so that intrusive field work could proceed while U.S. EPA progressed the draft Programmatic Agreement, which was submitted to U.S. EPA by Atlantic Richfield on February 18, 2013. Although Section 106 concurrence was received from both the California and Nevada State Historic Preservation Offices (SHPO) in late 2014, the Area of Potential Impact (APE) as documented in the Section 106 consultation may not be sufficient to cover all areas of investigation. Resolution on either progressing the Programmatic Agreement or the ability to modify the APE is needed in order to complete the Reference Soil Investigation, Reference Well drilling (if a third location is to be added or if either of the two proposed locations have to be moved) and for River Ranch activities if additional investigation areas need to be sampled, as well as for any additional data collection activities which may fall outside of the APE.

2. U.S. EPA approval of the Draft Final Reference Area Focused Remedial Investigation (FRI) Work Plan submitted to U.S. EPA on February 28, 2015.

Collection of the reference area data sets in 2015 is necessary for conducting interim data reviews of the different media as requested by U.S. EPA as a means of accelerating preparation of the RI Report.

3. U.S. EPA approval of On-Property FRI Work Plan Amendment No. 10 - Stream Sediment and Floodplain Characterization in the Beaver Dam Complex in the On-Property reach of Leviathan Creek. Atlantic Richfield received U.S. EPA's conditional approval and comment on February 20, 2015. An updated version of Amendment No. 10 will be submitted to U.S. EPA on March 20, 2015.

4. Agency coordination of the removal of beavers in the On-Property portion of Leviathan Creek is necessary to facilitate implementation of *On-Property Amendment No 10.*

5. Submittal and approval of a work plan outlining the detailed approach to beaver dam/pond complex access, water management and dam breaching / removal is necessary so that the area can be allowed to dry sufficiently for safe access and implementation of the investigation activities detailed in Amendment No. 10 as well as *Acidic Pond Characterization* activities as approved of in the *On-Property FRI Work Plan*. Plan to be submitted to U.S. EPA early in the second quarter 2015.

6. U.S. EPA approval of the Feasibility Study (FS) Approach is necessary to facilitate site specific data collection and treatability studies geared toward collection of data necessary for completion of an informed FS. Responses to U.S. EPA's comments dated January 15, 2015 are in progress.

7. Confirmation is needed from U.S. EPA that the proposed plant list and sampling approach presented in the recently submitted Draft Final Reference Area FRI Work Plan adequately addressed input from the Washoe Tribe. This confirmation is necessary to move forward with development and implementation of the Task Sampling and Analysis Plan (TSAP) for on-property and off-property plant sampling. Plant sampling is scheduled to begin in early spring.

8. Submittal and approval of the TSAP for on-property and off-property plant sampling, scheduled for early April 2015.

9. Submittal and approval of the River Ranch Phase II TSAP for detailed sampling. Submittal scheduled for the end of March 2015.

10. Approval of On-Property FRI Work Plan Amendment No. 8 (submitted October 2, 2014). Responses to U.S. EPA comments dated January 28, 2015 are in progress and scheduled to be submitted to U.S. EPA on March 13, 2015.

1.2 2015 PRIORITY ON-PROPERTY FRI FIELD INVESTIGATION(S)

FRI field investigations that are a priority for completion in the On-Property Study Area in 2015 are as follows:

1. Hydrogeologic Investigations

a. Drilling and Well Installation – continue drilling program with focus on completion of well installation

2. Acidic Drainage Investigations

   a. Beaver Pond Sediment/Floodplain Investigation – dependent upon EPA approval of On-Property FRI Work Plan Amendment No. 10 and ponds being dry.

   b. Acidic Pond Characterization – dependent on beaver ponds being dry

3. Storm Water and Snowmelt Runoff Investigations

   a. Installation of storm water stations in Aspen Creek Study Area

4. Bioassessment Investigations – plant and associated soil sampling

1.3 2015 PRIORITY OFF-PROPERTY RI FIELD INVESTIGATION(S)

FRI field investigations that are a priority for completion in the Off-Property Study Area in 2015 are as follows:

1. Downstream Study Area

   a. Floodplain Soil Investigations

   b. Bioassessment Investigations – plan and associated soil sampling

2. Supplemental Study Areas

   a. River Ranch Investigation

1.4 2015 PRIORITY REFERENCE AREA INVESTIGATION(S) – PENDING WORK PLAN SUBMITTAL/APPROVAL

FRI field investigations that are a priority for completion in the Reference Study Area in 2015 are as follows:

1. Initial Site Characterization/Mapping – completion of the floodplain mapping, previously approved by U.S. EPA

2. Hydrogeologic Investigations

   a. Drilling and Well Installation

   b. Groundwater Monitoring

3. Upland Soil Investigations

4. Floodplain Soil Investigations

5. Surface Water Investigations
6. Stream Sediment Investigations
7. River Ranch South Area Investigation
8. Bioassessment Investigations

1.5 2015 PRIORITY FS TASKS

Feasibility Study tasks that are a priority for completion in 2015 are as follows:

1. Interim Combined Treatability Study (TS) Report (Second Quarter 2015)
2. Geotechnical Investigation Work Plan Preparation (Second Quarter 2015)
    a. Geotechnical Characterization and Monument Installation – pending work plan submittal/approval
3. Revegetation TS Work Plan Preparation (Second Quarter 2015)
    a. Revegetation TS Design and Field Implementation – pending work plan submittal/approval

1.6 DATA EVALUATION REPORTS AND DELIVERABLES

Data Evaluation and Deliverables that are a priority for completion in 2015 are as follows:

1. The primary 2015 Data Evaluation Reports and Data Deliverables include:
    a. East Fork Carson River Technical Memorandum – submitted January 30
    b. Updated Data Quality Objectives and Cross-Reference Matrix – submitted February 28
    c. Reference Area Initial Characterization and Mapping Technical Memorandum – to be submitted in March 2015
    d. Plant Habitat Surveys Technical Memorandum – to be submitted in March 2015
    e. Revised Evaluation of Historical and RI/FS Surface Water Data – to be submitted in March 2015
    f. Interim Combined Acid Drainage Treatability Investigation Report – (Second Quarter 2015)
    g. Annual Data Summary Report – Third Quarter

1.7 OTHER DATA EVALUATIONS AND TECHNICAL DISCUSSIONS WITH U.S. EPA

Other Data Evaluations and Technical Discussions with U.S. EPA that are a priority for completion in 2015 are as follows:

1. Groundwater
2. Mine Waste Characterization

2.0 KEY ASSUMPTIONS FOR DEVELOPMENT OF CONCEPTUAL RI/FS SCHEDULE

Key scheduling assumptions used in the development of the attached conceptual RI/FS schedule for the Leviathan Mine site are summarized as follows:

- No major additions to the scope of planned activities will be necessary including no addition of new study areas and/or the expansion of the known extent of identified study areas, chemicals of potential concern, and media of interest.
- Based on interpretive analysis, we assume that certain RI sampling activities are complete (East Fork Carson River, surface water, and mine waste) and that U.S. EPA will concur in early 2015.
- RI sampling activities will be completed in the 2015 and 2016 field seasons. Critical tasks (those with a two-year duration) will begin in 2015, and non-critical tasks will be deferred to 2016. It is assumed that no significant additional sampling activities will be required in 2017.
- Laboratory analyses, data validation, and subsequent data usability evaluations and other interpretative analyses will require at least 15 months following the completion of sampling activities prior to the submittal of the Draft RI Report.
- No further delays related to compliance with the NHPA will be encountered, and a Programmatic Agreement will be executed in 2015.
- A limited number of interim data submittals will be prepared and submitted to the U.S. EPA following the completion of sampling activities for various media and/or study areas. These interim data submittals will be submitted as technical memoranda and are intended to provide the U.S. EPA with data summaries prior to the submittal of the RI Report. When possible, these interim data submittals will include a data usability evaluation. For planning purposes, it is assumed that interim data submittals will not be revised and resubmitted following the U.S. EPA's review; however, comments would be addressed as the content of these interim data submittals are incorporated into the RI report.
- The U.S. EPA will continue to review and provide comments on work plan submittals in a timely and responsive manner (e.g., 30 to 60 days after receipt). U.S. EPA will solicit comments from other project stakeholders (e.g., USFWS, USFS, NDEP, and the Washoe Tribe) and synthesize stakeholders' input to minimize delays to the project schedule.

- The Draft RI Report will be prepared separately from the Draft Baseline Human Health Risk Assessment (HHRA) and Draft Ecological Risk Assessment (ERA) reports. It is anticipated that Draft Baseline HHRA and ERA reports will be completed approximately 6 months following the completion of the Draft RI Report. This will allow for U.S. EPA review of the Draft RI Report prior to the submittal of the Baseline HHRA and ERA to limit revisions to these two documents. The Draft FS report will be prepared and submitted approximately 6 months after the completion of the Draft Baseline HHRA and ERA reports or approximately one year after the submittal of the Draft RI Report.

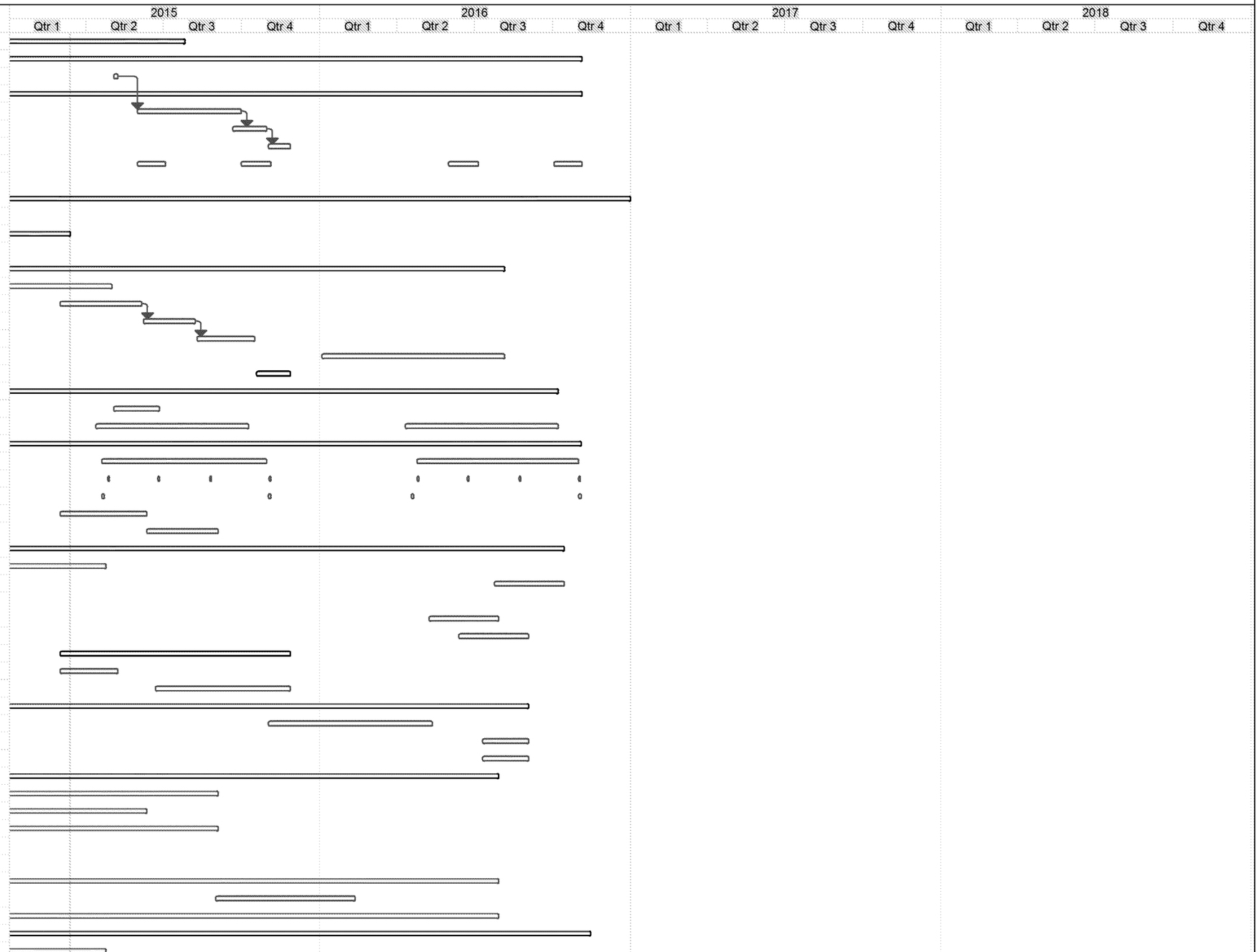
- It is assumed that the U.S. EPA agrees with the FS approach as outlined in Atlantic Richfield's August 27, 2014 letter. Where possible, Atlantic Richfield will consider conducting certain FS activities in parallel with the RI. The level of effort to conduct the FS will be similar to that presented in the letter, including conducting supporting studies (i.e., several white paper evaluations, with limited data gap studies and treatability studies) to provide information about site specific conditions and performance data relating to the various remedial technologies under evaluation. The supporting studies are not intended to provide all of the data needed for detailed design of the remedy.

- The FS will be conducted and reported consistent with U.S. EPA guidance and requirements and include identifying remedial action objectives, identifying and screening remedial technologies, developing remedial alternatives, evaluating them using criteria identified in the National Contingency Plan (NCP), comparing remedial alternatives against each other, recommending a remedial alternative for implementation, and documenting the evaluation in a FS report.

- Depending on the scope of the supporting studies, focused work plans will be prepared as necessary for field data collection tasks necessary for the FS, in collaboration with the LRWQCB, which the U.S. EPA will review in a timely manner.

Conceptual RI/FS Schedule as of 3/13/2015
Leviathan Mine Site
Apline County, California

ID	Task Name
1	**NHPA & Section 106 Consultation**
26	**On-Property Hydrogeologic Investigations**
27	**Mine Features - PUD**
28	**Drilling/Well Installation**
30	**2015 - Drilling/Well Installation**
31	**2015 - Well Development**
32	**2015 - Hydraulic Testing**
33	**Groundwater Monitoring**
42	**Mine Waste Work Plan Amendments**
48	**On-Going Monitoring (Met Station, Evap Pan, Water Levels)**
74	**Beaver Pond Monitoring**
97	**On-Property Amendment 9**
103	**Sediment Quality Triad**
108	**Beaver Dam/Pond Complex Removal and Investigation**
109	**On-Property Amendment 10 TSAP**
114	**Beaver Dam/Pond Complex Management Work Plan**
119	**Beaver Dam/Pond Complex Management Implementation**
120	**Floodplain and Sediment Characterization in the BD/PC**
121	**Beaver Pond Sediment/Floodplain Data Summary Submittal**
126	**On-Property Acid Pond Source Characterization (LCSA-4)**
127	**Storm Water**
128	**Install Storm Water Stations in the ACSA**
129	**Storm Water & Snowmelt Runoff Sampling**
134	**On & Off-Property Surface Water**
135	**CUD and Aspen Flow Station Monitoring**
147	**Source Sampling**
160	**Surface Water Flow & Geochemical Investigations**
169	**Doud Springs Mapping and Sampling TSAP**
174	**Doud Springs Mapping & Sampling field effort**
175	**On & Off-Property Stream Sediment and Floodplain**
176	**On-Property Amendment 8 TSAP**
183	**On-Property Stream Sediment Investigations**
184	**Off-Property Stream Sediment Investigations**
185	**On-Property Floodplain Soil Investigations**
186	**Off-Property Floodplain Soil Investigations**
187	**On & Off-Property Plant & Habitat-Related Soil Sampling**
188	**On & Off-Property Plant & Habitat-Related Soil Sampling TSAP**
193	**Plant and Soil Sampling Field Effort**
200	**On & Off-Property Fish Surveys**
202	**On & Off-Property Fish Sampling TSAP**
207	**On-Property Fish Surveys and Sampling Field Effort**
208	**Off-Property Fish Surveys and Sampling Field Effort**
209	**Supplemental Study Areas**
210	**River Ranch Investigation**
211	**River Ranch Phase 2 TSAP**
216	**River Ranch Investigation Field Effort**
220	**East Fork Carson River**
223	**Ore Piles**
224	**Leviathan Mine Road**
225	**Leviathan Mine Road Phase II Sampling TSAP**
230	**Leviathan Mine Road Investigation Field Effort**
234	**Reference Study Area Investigation**
235	**Reference Study Area FRI Work Plan**

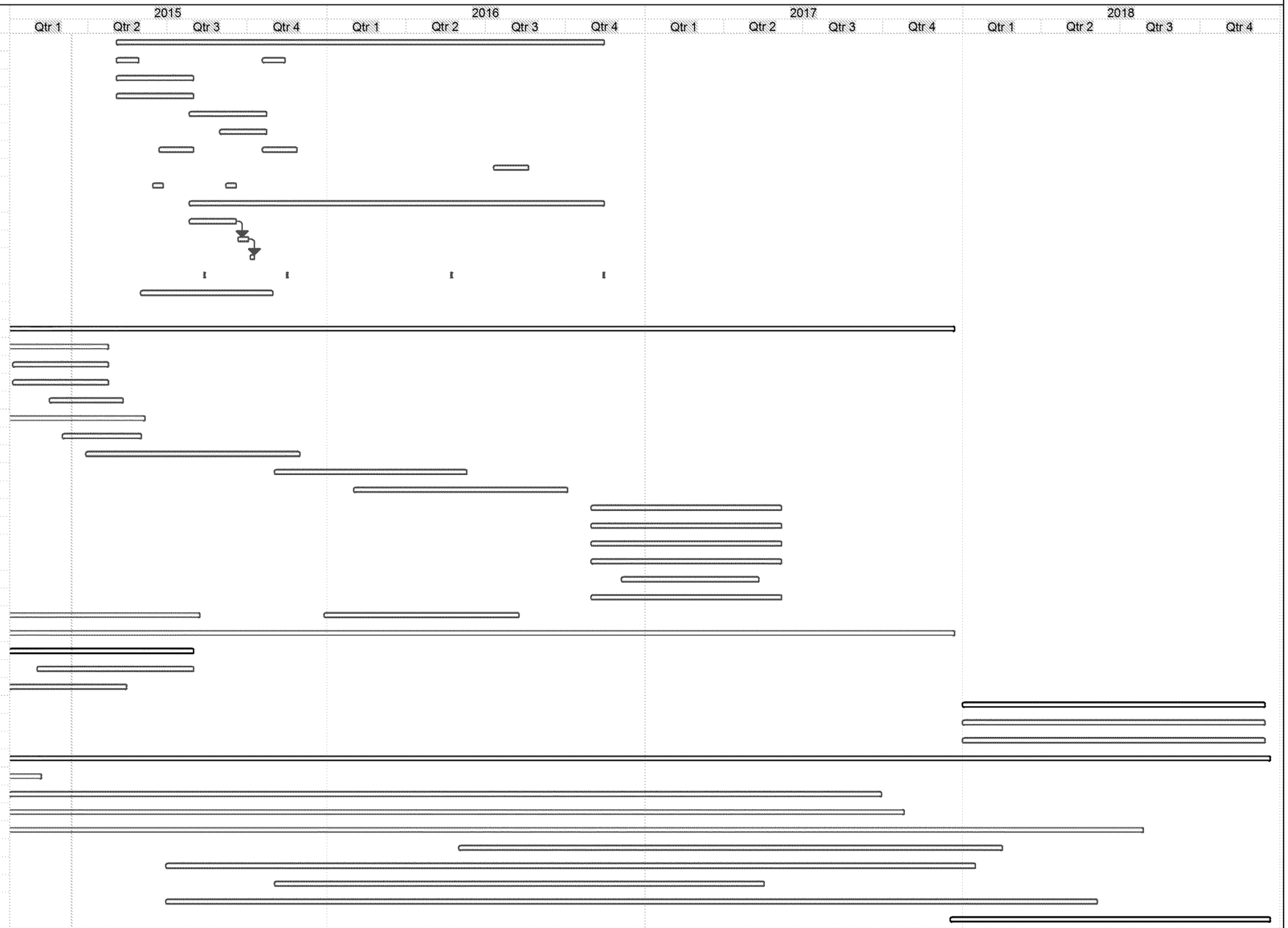


Note: See schedule assumptions in Attachment A to *Response to U.S. EPA Comments on Proposed Remedial Investigation/Feasibility Schedule* dated March 13, 2015

Task Task Summary

Conceptual RI/FS Schedule as of 3/13/2015
Leviathan Mine Site
Apline County, California

ID	Task Name
240	**Reference Study Area Field Effort**
241	**Surface Water Monitoring**
244	**Stream Sediment Investigations**
245	**Floodplain Soil Investigations**
246	**Mine Waste Soil**
247	**Ore Pile Soil**
248	**Plant and Habitat-Related Soil**
251	**Fish Survey and Sampling**
252	**Sediment Quality Triad Sampling**
255	**Hydrogeologic Investigations**
256	**2015 - Drilling/Well Installation**
257	**2015 - Well Development**
258	**2015 - Hydraulic Testing**
259	**Groundwater Monitoring**
264	**Storm Water**
265	**Data Gap Work Plans (To Be Determined as Needed)**
266	**RI Reporting**
267	**East Fork Carson River Data Summary Submittal**
272	**Technical Memo - Plant Species & Habitat Characterization**
277	**Technical Memo - Preliminary Investigations in RSA**
282	**Upper Tributary Interim Data Summary Submittal**
287	**Surface Water Evaluation**
292	**Groundwater Monitoring Interim Data Summary Submittal**
297	**Mine Waste Characterization Data Summary Submittal**
302	**Plants/Soil Data Summary Submittal**
307	**Sediment Quality Triad Data Summary Submittal**
312	**Ore Piles Data Summary Submittal**
317	**On & Off-Property Stream Sediment Data Summary Submittal**
322	**On & Off-Property Floodplain Data Summary Submittal**
327	**Storm Water/Snowmelt Data Summary Submittal**
332	**Fish Surveys/Tissue Data Summary Submittal**
337	**Leviathan Mine Road Data Summary Submittal**
342	**Annual Summary Reports**
347	**RI Report**
354	**Risk Assessment Work Plans**
355	**HHRA Work Plan**
359	**ERA Work Plan**
363	**Risk Assessments**
364	**Baseline Ecological Risk Assessment**
369	**Baseline Human Health Risk Assessment**
374	**Feasibility Study**
375	**Feasibility Work Plan**
376	**Suporting Study White Paper Evaluations**
384	**Geotechnical Engineering Studies**
390	**Source Water Control Studies**
401	**AD Capture & Conveyance Studies**
407	**Secondary Treatment Studies**
414	**Upper Aspen Seep Treatability Study**
418	**Sludge Management Studies**
426	**Feasibility Study Report**



Note: See schedule assumptions in Attachment A to *Response to U.S. EPA Comments on Proposed Remedial Investigation/Feasibility Schedule* dated March 13, 2015

Task Task Summary

ATTACHMENT B

Annotated Table of Content for Remedial Investigation, Volume 1

DRAFT
ANNOTATED TABLE OF CONTENTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT
VOLUME 1: REMEDIAL INVESTIGATION

Leviathan Mine Site
Alpine County, California

EXECUTIVE SUMMARY

1.0 INTRODUCTION

1.1 PURPOSE OF REMEDIAL INVESTIGATION

- describe purpose of RI, typical components per EPA RI/FS guidance, required components per Statement of Work

1.2 REPORT ORGANIZATION

- outline key sections of RI Report and summarize contents of each key section

1.3 REGULATORY GUIDANCE

- list the main regulatory guidance used to develop the remedial investigation

2.0 SITE BACKGROUND AND REGIONAL SETTING

2.1 SITE BACKGROUND

- describe site background including CERCLA definition of site and site history

2.1.1 Site Description

2.1.2 Site History

2.2 REGIONAL SETTING

- the following subsections will provide a summary of generalized regional conditions based on information available prior to the implementation of FRIs

2.2.1 Demography and Land Use

2.2.2 Climate

2.2.3 Surface Features and Topography

2.2.4 Geology

2.2.5 Hydrogeology

2.2.6 Ecology

3.0 SUMMARY OF PREVIOUS INVESTIGATIONS

- the following subsections will provide a summary of previous investigations conducted by various parties prior to the implementation of FRIs, key investigators listed below.

3.1 SURFACE WATER INVESTIGATIONS

- LRWQCB studies
- EPA studies
- USGS studies
- Others

3.2 GEOLOGIC INVESTIGATIONS

- Busby et al. (2013)
- Norris and Webb (1990)

- Clark (1977)
- John, et.al (1981)
- Stewart, et.al. (1982)
- Wachter (1971)
- Rowan and Purdy (1984)
- Sciacca (1984)
- Wilshire (1957)

3.3 HYDROGEOLOGIC INVESTIGATIONS

- USGS studies
- Others

3.4 SOIL INVESTIGATIONS

- Evans and JBR (2004)
- Robison (2008)
- McGinley & Associates (2012)
- USFS (2003)
- Others

3.5 BIOASSESSMENT STUDIES

- Herbst & Black studies
- USGS studies
- USFWS studies
- Others

4.0 REMEDIAL INVESTIGATION APPROACH AND STUDY AREA CHARACTERISTICS

4.1 FOCUSED REMEDIAL INVESTIGATION APPROACH

- the following subsections will provide a summary of study area characteristics defined for the purposes FRI implementation

4.1.1 Focused Remedial Investigation Work Plans

- describe organization of FRI program and supporting work plans

4.1.2 Chemicals of Potential Concern

- describe development of list of COPCs/COPECs considered for FRI work plan development

4.1.3 Media of Interest

- describe environmental media of interest considered for FRI work plan development

4.1.4 Data Quality Objectives

- describe development of Data Quality Objectives for various media of interest as the basis for FRI work plan development

4.1.5 Preliminary Site Conceptual Model

- describe preliminary chemical migration and exposure pathways used as the basis for FRI work plan development

4.2 STUDY AREA CHARACTERISTICS

- the following subsections will provide a summary of study area characteristics defined for the purposes FRI implementation

4.2.1 On-Property Study Areas

4.2.1.1 Aspen Creek Study Area

- describe extent of study area and characteristics – include location map(s)

4.2.1.2 Leviathan Creek Study Area

- describe extent of study area and characteristics – include location map(s)

4.2.1.3 Pit Study Area

- describe extent of study area and characteristics – include location map(s)

4.2.2 Off-Property Study Areas

4.2.2.1 Downstream Study Area

- describe extent of study area and characteristics – include location map(s)

4.2.2.2 River Ranch

- describe extent of study area and characteristics – include location map(s)

4.2.2.3 East Fork Carson River

- describe extent of study area and characteristics – include location map(s)

4.2.2.4 Leviathan Mine Road

- describe extent of study area and characteristics – include location map(s)

4.2.2.5 Suspected Ore Piles

- describe extent of study area and characteristics – include location map(s)

4.2.3 Reference Study Areas

4.2.3.1 On-Property

- describe extent of study area and characteristics including basis for use as a reference study area – include location map(s)

4.2.3.2 Upper Mountaineer Creek

- describe extent of study area and characteristics including basis for use as a reference study area – include location map(s)

4.2.3.3 Lower Mountaineer Creek

- describe extent of study area and characteristics including basis for use as a reference study area – include location map(s)

4.2.3.4 Cottonwood Creek

- describe extent of study area and characteristics including basis for use as a reference study area – include location map(s)

5.0 STUDY AREA INVESTIGATIONS

5.1 ON-PROPERTY STUDY AREA

- the following subsections will describe the scope of investigations performed within the On-Property Study Areas **(applicable planning documents shown in bold font)**

5.1.1 Site Features and Facilities

- **On-Property FRI Work Plan (8/11/2010)**
- summarize scope of investigations of mine site features and facilities – include location map(s)

5.1.2 Meteorological Data

- **On-Property FRI Work Plan (8/11/2010)**
- summarize scope of meteorological investigations – include location map(s)

5.1.3 Acid Drainage

- **On-Property FRI Work Plan (8/11/2010)**
- **On-Property FRI Work Plan Amendment No. 1 (4/24/2012)**
- **On-Property FRI Work Plan Amendment No. 5 (6/17/2013)**
- summarize scope of acid drainage investigations – include location map(s)

5.1.4 Surface Water

- **On-Property FRI Work Plan (8/11/2010)**
- **April 10, 2012 Letter**
- **April 15, 2013 Letter**
- summarize scope of surface water investigations in On-Property Study area (include flow measurements, sample location map(s), # of samples, sample analytes)

5.1.5 Storm Water and Snowmelt Runoff

- **On-Property FRI Work Plan (8/11/2010)**
- **On-Property FRI Work Plan Amendment No. 3 (10/5/2013)**
- summarize scope of storm water and snowmelt runoff investigations (include sample location map(s), # of samples, sample analytes)

5.1.6 Stream Sediment

- **On-Property FRI Work Plan (8/11/2010)**
- **On-Property FRI Work Plan Amendment No. 8 (10/2/2014)**
- **Revised On-Property FRI Work Plan Amendment No. 10 (11/7/2014)**
- summarize scope of stream sediment investigations (include sample location map(s), # of samples, sample analytes)

5.1.7 Floodplain Soil

- **On-Property FRI Work Plan (8/11/2010)**
- **On-Property FRI Work Plan Amendment No. 8 (10/2/2014)**
- **Revised On-Property FRI Work Plan Amendment No. 10 (11/7/2014)**
- summarize scope of floodplain soil investigations (include sample location map(s), # of samples, sample analytes)

5.1.8 Mine Waste

- **On-Property FRI Work Plan (8/11/2010)**
- **On-Property FRI Work Plan Amendment No. 6, Revision No. 1 - Characterization of Mine Waste Using FPXRF Screening Survey (6/4/2014)**
- **On-Property FRI Work Plan Amendment No. 6, Revision No. 1 - Final TSAP for Phase 2 Mine Waste (11/28/2014)**
- summarize scope of mine waste investigations (include sample location map(s), # of samples, sample analytes)

5.1.9 Groundwater

- **On-Property FRI Work Plan (8/11/2010) & other informal submittals**
- summarize scope of hydrogeological investigations (include test boring and monitoring well locations, aquifer testing, depth to groundwater measurements, groundwater sampling, # of samples, sample analytes)

5.1.10 Plants

- **On-Property FRI Work Plan (8/11/2010), TSAP in preparation**
- summarize scope of plant surveys, plant sampling, and related soil investigations (include sample location map(s), # of samples, sample analytes)

5.1.11 Benthic Macroinvertebrates

- **On-Property FRI Work Plan (8/11/2010)**
- **On-Property FRI Work Plan Amendment No. 7 (6/14/2013)**
- summarize scope of benthic macroinvertebrate investigations (include sample location map(s), # of samples, sample analytes)

5.1.12 Fish

- **On-Property FRI Work Plan (8/11/2010)**
- **October 22, 2013 Letter (opportunistic sampling Aspen Creek)**
- summarize scope of fish investigations (include sample location map(s), # of samples, sample analytes)

5.1.13 Upper Tributary Investigations

- **On-Property FRI Work Plan Amendment No. 2 (8/3/2012)**
- summarize scope of investigations in the Upper Tributary area (surface water flow and groundwater elevation measurements, location map)

5.1.14 Geotechnical Investigations

- **On-Property FRI Work Plan (8/11/2010), TSAP in preparation**
- summarize scope of geotechnical investigations (include sample location map(s), # of samples, testing parameters)

5.2 OFF-PROPERTY STUDY AREA

- the following subsections will describe the scope of investigations performed within Off-Property Study Areas **(applicable planning documents shown in bold font)**

5.2.1 Downstream Study Area

5.2.1.1 Surface Water

- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013)**

- **April 10, 2012 Letter**
- **April 15, 2013 Letter**
- summarize scope of surface water investigations in DSA (include flow measurements, sample location map(s), # of samples, sample analytes)

5.2.1.2 Stream Sediment

- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013)**
- summarize scope of stream sediment investigations in DSA (include sample location map(s), # of samples, sample analytes)

5.2.1.3 Floodplain Soil

- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013)**
- **Off-Property FRI Revised Addendum No. 2, Amendment No. 1 (6/17/2014)**
- summarize scope of floodplain soil investigations in DSA (include sample location map(s), # of samples, sample analytes)

5.2.1.4 Plants

- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013), TSAP in preparation**
- summarize scope of plant surveys, plant sampling, and related soil investigations in DSA (include sample location map(s), # of samples, sample analytes)

5.2.1.5 Benthic Macroinvertebrates

- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013)**
- summarize scope of benthic macroinvertebrate investigations in DSA (include sample location map(s), # of samples, sample analytes)

5.2.1.6 Fish

- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013)**
- **October 22, 2013 Letter (opportunistic sampling in Leviathan/Bryant Creeks)**
- summarize scope of fish investigations in DSA (include sample location map(s), # of samples, sample analytes)

5.2.2 River Ranch

5.2.2.1 Soil

- **Reference Area FRI Work Plan Addendum No. 1 (9/11/2012)**
- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013)**
- **Final Revised/Accelerated River Ranch Soil Investigation (8/28/2014)**
- **TSAP for Irrigation System and Soil Mapping (10/16/2014)**
- TSAP for Detailed Sampling for Laboratory Analysis – in preparation
- summarize scope of soil investigations on River Ranch (include sample location map(s), # of samples, sample analytes)

5.2.3 East Fork Carson River

5.2.3.1 Surface Water

- **Off-Property FRI Work Plan Addendum No. 1 (5/25/2012)**
- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013)**
- summarize scope of surface water investigations in EFCR (include sample location map(s), # of samples, sample analytes)

5.2.3.2 Stream Sediment

- **Off-Property FRI Work Plan Addendum No. 1 (5/25/2012)**
- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013)**
- summarize scope of stream sediment investigations in EFCR (include sample location map(s), # of samples, sample analytes)

5.2.3.3 Benthic Macroinvertebrates

- **Off-Property FRI Work Plan Addendum No. 1 (5/25/2012)**
- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013)**
- summarize scope of benthic macroinvertebrate investigations in EFCR (include sample location map(s), # of samples, sample analytes)

5.2.4 Leviathan Mine Road

- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013)**
- summarize scope of soil investigations along Leviathan Mine Road (include sample location map(s), # of samples, sample analytes)

5.2.5 Suspected Ore Piles

- **Off-Property FRI Work Plan Revised Addendum No. 2 (6/28/2013)**
- summarize scope of soil investigations at Suspected Ore Piles (include sample location map(s), # of samples, sample analytes)

5.3 REFERENCE STUDY AREA

- the following subsections will describe the scope of investigations performed within Reference Study Areas **(applicable planning documents shown in bold font)**

5.3.1 Terrestrial Soil

- **Reference Area FRI Work Plan (2/28/2015)**
- summarize scope of reference soil investigations within On-Property Study Area and River Ranch (include sample location map(s), # of samples, sample analytes)

5.3.2 Groundwater

- **Reference Area FRI Work Plan (2/28/2015)**
- summarize scope of reference groundwater investigations (include monitoring well location map(s), # of samples, sample analytes)

5.3.3 Surface Water

- **Reference Area FRI Work Plan, Addendum No. 1 (9/11/2012)**
- **Reference Area FRI Work Plan (2/28/2015)**

- summarize scope of surface water investigations in reference study areas (include sample location map(s), # of samples, sample analytes)

5.3.4 Stream Sediment

- **Reference Area FRI Work Plan (2/28/2015)**
- summarize scope of stream sediment investigations in reference study areas (include sample location map(s), # of samples, sample analytes)

5.3.5 Floodplain Soil

- **Reference Area FRI Work Plan (2/28/2015)**
- summarize scope of floodplain soil investigations in reference study areas (include sample location map(s), # of samples, sample analytes)

5.3.6 Plants

- **Reference Area FRI Work Plan (2/28/2015)**
- summarize scope of plant surveys, plant sampling, and related soil investigations in reference study areas (include sample location map(s), # of samples, sample analytes)

5.3.7 Benthic Macroinvertebrates

- **Reference Area FRI Work Plan, Addendum No. 2 (6/14/2013)**
- **Reference Area FRI Work Plan (2/28/2015)**
- summarize scope of benthic macroinvertebrate investigations in reference study areas (include sample location map(s), # of samples, sample analytes)

5.3.8 Fish

- **Reference Area FRI Work Plan (2/28/2015)**
- **October 22, 2013 Letter (opportunistic sampling Mountaineer Creek)**
- summarize scope of fish investigations in reference study areas (include sample location map(s), # of samples, sample analytes)

6.0 DATA USEABILITY EVALUATION

- this section will describe the sources of data used in the RI, how they were evaluated for quality, and whether or not they are suitable for use and related decision making in the RI, baseline risk assessments, and the FS.

6.1 DATA SOURCES

- describe relevant sources of data to be considered for use in the RI

6.2 DOCUMENTATION

- describe various planning documents (e.g., work plans, SAP, SOPs, etc) and variances from these planning documents

6.2 LABORATORY METHODS AND ANALYSIS

- describe various laboratory methods and analyses for data to be used in the RI

6.3 QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

- this section summarizes the precision and representativeness of field data collection protocols and laboratory analytical processes to ensure that data used in the RI are of suitable quality for use in decision making in the RI and FS.

6.4 DATA QUALITY INDICATORS

- describe application of data quality indicators including completeness, comparability, representativeness, precision, and accuracy

6.5 DATA USEABILITY EVALUATION

- this section summarizes the evaluation of RI data relative to data useability criteria

7.0 NATURE AND EXTENT OF CONTAMINATION

7.1 EXTENT OF CONTAMINATION EVALUATION

- the following subsections will describe criteria and methods to be used in the evaluation of the extent of contamination in On-Property and Off-Property Study Areas

7.1.1 Indicator Contaminants

- describe the selection of indicator contaminants to be used to streamline and focus the evaluation of the extent of contamination

7.1.2 Spatial and Temporal Trends

- describe methods to be used for the evaluation of spatial and temporal trends in support of the evaluation of the extent of contamination

7.1.3 Reference Concentrations

- describe development of reference concentrations for various media of interest, describe techniques to be used for the comparison of reference concentrations to site data in support of the evaluation of the extent of contamination

7.1.3.1 Surface Water

- present development of reference concentrations for surface water

7.1.3.2 Storm Water and Snowmelt Runoff

- present development of reference concentrations for surface water

7.1.3.3 Stream Sediment

- describe development of reference concentrations for stream sediment

7.1.3.4 Floodplain Soil

- describe development of reference concentrations for floodplain soil

7.1.3.5 Terrestrial Soil and Mine Waste

- describe development of reference concentrations for terrestrial soil and mine waste

7.1.3.6 Groundwater

- describe development of reference concentrations for groundwater

7.1.3.7 Plants

- describe development of reference concentrations for plants

7.1.3.8 Fish

- describe development of reference concentrations for fish

7.1.3.9 Terrestrial Soil at River Ranch

- describe development of reference concentrations for terrestrial soil at River Ranch

7.1.3.10 Terrestrial Soil at Suspected Ore Piles

- describe development of reference concentrations for terrestrial soil at suspected ore piles

7.1.3.11 Terrestrial Soil along Leviathan Mine Road

- describe development of reference concentrations for terrestrial soil at suspected ore piles

7.1.3.12 Surface Water in EFCR

- describe development of reference concentrations for surface water in EFCR

7.1.4 Chemical-Specific ARARs

- describe methods to be used for the comparison of chemical-specific ARARs to site data in support of the evaluation of the extent of contamination

7.1.5 Risk-based Screening Levels

- describe methods to be used for the comparison of risk-based screening levels to site data in support of the evaluation of the extent of contamination

7.2 Nature and Extent of Contamination

- the following subsections will describe the nature and extent of contamination in the On-Property and Off-Property Study Areas including tabular statistical comparisons to reference concentrations, ARARs, and risk-based screening levels and graphical presentations of sampling data to illustrate the extent of contamination.

7.2.1 Acid Drainage Sources

- describe spatial locations of acid drainage sources and evaluate temporal trends in sampling results for acid drainage sources including tabular compilations and graphical presentations of sampling data

7.2.2 Surface Water

- present flow measurements and sampling results for surface water sampling locations including tabular statistical comparisons and graphical presentations of sampling data (include flow hydrographs, mass flux calculations, and time-concentration plots)

7.2.2.1 Spatial and Temporal Trends

- - present an evaluation of spatial and temporal trends in surface water flows, surface water quality, and mass flux estimates including tabular compilations and graphical presentations of sampling data

7.2.2.2 Comparison to Reference Concentrations

- - present comparisons of surface water sampling data to reference concentrations

7.2.2.3 Comparison to Risk-based Screening Levels and ARARs

- - present comparisons of surface water sampling data to risk-based screening levels and ARARs

7.2.3 Storm Water and Snowmelt Runoff

- present sampling results for storm water and snowmelt runoff sampling locations including tabular statistical comparisons and graphical presentations of sampling data

7.2.3.1 Spatial and Temporal Trends

- - present an evaluation of spatial and temporal trends in storm water and snowmelt runoff including tabular compilations and graphical presentations of sampling data

7.2.3.2 Comparison to Reference Concentrations

- - present comparisons of storm water and snowmelt runoff sampling data to reference concentrations

7.2.3.3 Comparison to Risk-based Screening Levels and ARARs

- - present comparisons of storm water and snowmelt runoff data to risk-based screening levels and ARARs

7.2.4 Stream Sediment and Benthic Macroinvertebrate Community Characterization

- present sampling results for stream sediment and benthic macroinvertebrate community characterization including tabular statistical comparisons and graphical representations of stream sediment sampling data, sediment bioassay testing results, and benthic macroinvertebrate community characterization

7.2.4.1 Stream Sediment Characterization

- present an evaluation stream sediment sampling and bioassay testing results including tabular compilations and graphical presentations of sampling data

7.3.4.2 Benthic Macroinvertebrate Community Characterization

- present results of benthic macroinvertebrate community characterization including tabular statistical comparisons and graphical presentations of data

7.2.4.2 Comparison of Stream Sediment to Reference Concentrations

- present comparisons of stream sediment sampling data to reference concentrations

7.2.4.3 Comparison of Stream Sediment to Risk-based Screening Levels and ARARs

- present comparisons of stream sediment data to risk-based screening levels and ARARs

7.2.4.4 Sediment Quality Triad Screening Evaluation

- present weight of evidence evaluation of sediment quality triad data

7.2.5 Floodplain Soil

- present sampling results for floodplain soil sampling locations including tabular statistical comparisons and graphical representations of sampling data

7.2.5.1 Spatial Trends

- present an evaluation of spatial trends in floodplain soil data including tabular compilations and graphical presentations of sampling data

7.2.5.2 Comparison to Reference Concentrations

- present comparisons of floodplain soil sampling data to reference concentrations

7.2.5.3 Comparison to Risk-based Screening Levels and ARARs

- present comparisons of floodplain soil data to risk-based screening levels and ARARs

7.2.6 Terrestrial Soil and Mine Waste

- present sampling results for terrestrial soil and mine waste sampling locations including tabular statistical comparisons and graphical representations of sampling data

7.2.6.1 Spatial Trends

- present an evaluation of spatial trends in terrestrial soil and mine waste including tabular compilations and graphical presentations of sampling data

7.2.6.2 Comparison to Reference Concentrations

- present comparisons of terrestrial soil and mine waste sampling data to reference concentrations

7.2.6.3 Comparison to Risk-based Screening Levels and ARARs

- present comparisons of terrestrial soil and mine waste sampling data to risk-based screening levels and ARARs

7.2.7 Groundwater

- present boring logs, groundwater monitoring well construction details, aquifer testing results, groundwater elevations, and groundwater sampling results (include potentiometric maps, well hydrographs, time-concentrations plots, chemical distribution maps, tabular statistical comparisons, and other graphical presentations of sampling data)

7.2.7.1 Spatial and Temporal Trends

- present an evaluation of spatial and temporal trends in groundwater including tabular compilations and graphical presentations of sampling data

7.2.7.2 Comparison to Reference Concentrations

- present comparisons of groundwater sampling data to reference concentrations

7.2.7.3 Comparison to Risk-based Screening Levels and ARARs

- present comparisons of groundwater sampling data to risk-based screening levels and ARARs

7.2.8 Plants

- present plant surveys and plant sampling results for plant sampling locations including tabular statistical comparisons and graphical presentations of sampling data

7.2.8.1 Spatial Trends

- present an evaluation of spatial trends in plant and related soil sampling data including tabular compilations and graphical presentations of sampling data

7.2.8.2 Development of Plant Uptake Factors

- present the development of plant uptake factors with comparisons across and between study areas, habitat types, and plant types. Present recommended plant uptake factors

7.2.8.3 Comparison to Risk-based Screening Levels

- present comparisons of plant and related soil sampling data to risk-based screening levels

7.2.9 Fish

- present fish surveys and fish sampling results including tabular statistical comparisons and graphical presentations of sampling data

7.2.9.1 Spatial Trends

- present an evaluation of spatial trends in fish sampling data including tabular compilations and graphical presentations of sampling data

7.2.9.2 Comparison to Reference Concentrations

- present comparisons of fish sampling data to reference concentrations

7.2.9.3 Comparison to Risk-based Screening Levels and ARARs

- present comparisons of fish sampling data to risk-based screening levels and ARARs

7.2.10 Terrestrial Soil at River Ranch

- present sampling results for terrestrial soil sampling locations on River Ranch including tabular statistical comparisons and graphical representations of sampling data

7.2.10.1 Spatial Trends

- present an evaluation of spatial trends in terrestrial soil at River Ranch including tabular compilations and graphical presentations of sampling data

7.2.10.2 Comparison to Reference Concentrations

- present comparisons of River Ranch terrestrial soil sampling data to reference concentrations

7.2.10.3 Comparison to Risk-based Screening Levels

- present comparisons of River Ranch terrestrial soil sampling data to risk-based screening levels

7.2.11 Terrestrial Soil at Suspected Ore Piles

- present sampling results for terrestrial soil sampling locations at suspected ore piles including tabular statistical comparisons and graphical representations of sampling data

7.2.11.1 Spatial Trends

- present an evaluation of spatial trends in terrestrial soil at suspected ore piles including tabular compilations and graphical presentations of sampling data

7.2.11.2 Comparison to Reference Concentrations

- present comparisons of terrestrial soil sampling data to reference concentrations

7.2.11.3 Comparison to Risk-based Screening Levels

- present comparisons of terrestrial soil sampling data to risk-based screening levels

7.2.12 Terrestrial Soil along Leviathan Mine Road

- present sampling results for terrestrial soil sampling locations adjacent to Leviathan Mine Road including tabular statistical comparisons and graphical representations of sampling data

7.2.12.1 Spatial Trends

- present an evaluation of spatial trends in terrestrial soil adjacent to Leviathan Mine Road including tabular compilations and graphical presentations of sampling data

7.2.12.2 Comparison to Reference Concentrations

- present comparisons of terrestrial soil sampling data to reference concentrations

7.2.12.3 Comparison to Risk-based Screening Levels

- present comparisons of terrestrial soil sampling data to risk-based screening levels

7.3.13 East Fork Carson River

7.3.13.1 Surface Water

- present sampling results for surface water sampling locations in EFCR including tabular statistical comparisons to reference concentrations and graphical presentations of sampling data

7.3.13.2 Stream Sediment

- present sampling results for stream sediment sampling locations in EFCR including tabular statistical comparisons and graphical presentations of sampling data

7.3.13.3 Benthic Macroinvertebrate Community Characterization

- present results of benthic macroinvertebrate investigations in EFCR including tabular statistical comparisons and graphical presentations of data

7.3.13.4 Sediment Quality Triad Screening Evaluation

- present weight of evidence evaluation of sediment quality triad data

7.3.13.5 Comparison of Surface Water to Risk-based Screening Levels for Human Health Risk Evaluation

- present comparison of surface sampling results for EFCR to risk-based screening levels

8.0 CONTAMINANT FATE AND TRANSPORT

8.1 SITE CONCEPTUAL MODEL

- the following subsections will describe refinements in the site conceptual model based on information collected during FRI implementation

8.1.1 Acid Drainage Formation Mechanisms

- describe updated site conceptual model relative to acid drainage formation based on FRI results

8.1.2 Groundwater

- describe updated site conceptual model relative to hydrostratigraphy, groundwater flow conditions, and groundwater chemistry based on FRI results

8.1.3 Groundwater-Surface Water Interactions

- describe site conceptual model relative to groundwater-surface water interactions based on FRI results

8.1.4 Surface Water

- describe site conceptual model relative to surface water flow and chemistry based on FRI results

8.1.5 Site Water Balance

- describe quantification of various inflow and outflow components to the site water balance including

8.2 POTENTIAL ROUTES OF MIGRATION

- the following subsections will describe potential routes of COPC/COPEC migration in media of interest

8.2.1 Groundwater

- describe potential migration of COPCs in groundwater

8.2.2 Surface Water

- describe potential migration of COPCs in surface water

8.2.3 Soil

- describe potential migration of COPCs in soil

8.2.4 Sediment

- describe potential migration of COPCs in sediment

8.2.5 Air

- describe potential migration of COPCs in air

8.3 CONTAMINANT FATE AND PERSISTANCE

- this subsection will summarize physical, chemical, and/or biological factors influencing the fate and persistence of COPC/COPECs in media of interest

9.0 SUMMARY AND CONCLUSIONS

- the following subsections will summarize the overall approach used to implement FRIs in the On-Property and Off-Property Study Areas, the characterization the nature and extent of contamination, refinement of the Site Conceptual Model, and key conclusions relative to the evaluation of remedial alternatives.

9.1 REMEDIAL INVESTIGATION APPROACH

9.2 NATURE AND EXTENT OF CONTAMINATION

9.3 SITE CONCEPTUAL MODEL

9.4 CONCLUSIONS

9.5 DATA LIMITATIONS AND RECOMMENDATIONS

10.0 REFERENCES

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ATTACHMENT C

Annotated Table of Content for Human Health Risk Assessment, Volume 2

DRAFT
ANNOTATED TABLE OF CONTENTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT
VOLUME 2: BASELINE HUMAN HEALTH RISK ASSESSMENT

Leviathan Mine Site
Alpine County, California

EXECUTIVE SUMMARY

1.0 INTRODUCTION

1.1 PURPOSE OF BASELINE HUMAN HEALTH RISK ASSESSMENT

- describe the purpose of the baseline human health risk assessment (BHHRA).

1.2 REPORT ORGANIZATION

- provide an outline for the subsequent main sections of the report and summarizes contents of these sections

1.3 Regulatory Guidance

- list the main regulatory guidance documents used to develop the BHHRA

2.0 SITE BACKGROUND AND REGIONAL SETTING

- obtain information from the RI. It will describe site background including CERCLA definition of the site and site history. It will include a figure showing the mine site.

2.1 SITE BACKGROUND

- obtain from the RI but focus on information relevant to the human health risk assessment. It will describe site background including CERCLA definition of the site and site history. It will included a figure showing the mine site

2.1.2 Site Description
2.1.2 Site History

2.2 REGIONAL SETTING

- obtain from the RI. The following subsections will provide a summary of generalized regional conditions based on information available prior to the implementation of FRIs and will focus on information relevant to the human health risk assessment.

2.2.1 Demography and Land Use
2.2.2 Climate
2.2.3 Surface Features and Topography
2.2.4 Geology
2.2.5 Hydrogeology
2.2.6 Habitat and Biota Description

2.3 PREVIOUS MITIGATION AND RESPONSE ACTIONS

- describe ongoing mitigation activities.

2.4 PREVIOUS HUMAN HEALTH RISK EVALUATION

- describe the previous human health evaluation

3.0 DATA EVALUATION

- Data evaluation will be discussed by media and then by study area. Available data will be identified, and the rationale for selecting data for the risk assessment will be presented. This section will rely on the RI for much of this information. On-, off-property and reference data sets will be evaluated within each section. In some cases, study areas may be further divided into data evaluation units based on significant differences

in concentration. Detailed written summaries of the data evaluation will be presented in appendixes to the risk assessment. Each subsection will address data usability, data adequacy, and COPC selection. Usable data will be summarized and statistical summaries will be presented in tables for each media within each study area or data evaluation unit. On-property and off-property concentrations will be compared to reference concentrations in each section. This section will refer to the RI report as appropriate for this information.

3.1 SURFACE WATER

3.2 STREAM SEDIMENT

3.3 FLOODPLAIN SOIL

3.4 FISH TISSUE

3.5 PLANTS

3.6 MINE WASTE/OVERBURDEN

3.7 RIVER RANCH SOIL

- This section may only present a screening evaluation if area meets screening criteria.

3.8 SUSPECTED ORE PILES

- This section may only present a screening evaluation if area meets screening criteria.

3.9 LEVIATHAN MINE ROAD

- This section may only present a screening evaluation if area meets screening criteria.

3.10 EAST FORK CARSON RIVER

- This section may only present a screening evaluation if area meets screening criteria.

4.0 EXPOSURE ASSESSMENT

- describe the exposure evaluation process.

4.1 SITE CHARACTERISTICS

- provide a brief overview of site conditions relevant to human health risk assessment. Specific language to be taken from RI report.
  - Site ownership
  - Current/future land uses
  - Site conditions affecting exposure scenarios/pathways

4.2 CONCEPTUAL SITE MODEL FOR BASELINE HUMAN HEALTH RISK ASSESSMENT

- discuss the conceptual site model. A figure showing the conceptual site model and tables summarizing the information will be presented.

4.2.1 Chemical Sources and Locations

- Use RI for discussion in this section

4.2.2 Fate and Transport

- describe fate and transport mechanisms, the information in the RI relevant to these mechanisms, and relevance of the mechanisms to the human health risk assessment
  - Fugitive Dust Generation

- Leaching (Infiltration)
- Groundwater Transport
- Surface Water Runoff
- Erosion
- Deposition of Sediment
- Biotic Uptake

4.2.3 Potential Receptors

- provide a narrative description of these receptors and exposure scenarios.
  - Current/Future Trespasser
  - Current/Future Recreational Visitor
  - Current/Future Off-Site Rancher
  - Current/Future Off-Site Resident
  - Current/Future Washoe Tribe Member - Foraging
  - Future Washoe Tribe Member – Subsistence

4.2.4 Exposure Points and Routes

- describe the exposure routes relevant to each of the exposure media.

Primary Exposure Media

- Surface Water
- Stream Sediment
- Floodplain Soil
- Mine waste/Overburden

Secondary Exposure Media

- Fish
- Plants
- Wildlife
- Cattle

4.2.5 Exposure Pathways

- describe the potential exposure pathways for current and future land use at the site by each identified receptor.
  - Current Trespasser
  - Current/Future Recreational Visitor
  - Current Off-Site Rancher
  - Current Off-Site Resident
  - Current and Future Washoe Tribe Member
  - Future Subsistence Washoe Tribe Member

4.2.6 Exposure Scenarios by Study Area and Data Evaluation Unit

- describe relationship of study areas (including reference areas) or data evaluation units to receptors to create complete exposure scenarios with a physical location. Some receptors may have more than one exposure scenario/location (e.g., recreational use will occur in all four study areas.)

Figures will present receptors and exposure pathways relevant to each study area and/or data evaluation unit.

4.2.6.1 Study Areas

- Pit Study Area
- Leviathan Creek Study Area
- Aspen Creek Study Area
- Downstream Study Area
- Reference Study Area
- Supplemental Study Areas – **These study areas will be included in the HHRA based on the results of the screening evaluation.**

4.2.6.2 Data Evaluation Units

- Compare COPC concentrations within study areas to appropriate reference concentrations and evaluate spatial variability in COPC concentrations. If there is significant variation in COPC concentrations within a study area, the study area may be subdivided into discrete data evaluation units for consideration in the HHRA. This subsection will describe the data evaluation units and provide tables summarizing relevant data.

4.3 EXPOSURE QUANTIFICATION

- describe how exposure will be quantified for the exposure scenarios for the site.

4.3.1 Exposure Point Concentrations

- describe the calculation of exposure point concentrations for all 3 study areas and/or data evaluation units by media. Tables summarizing the results will be presented.

4.3.2 Exposure Equations

- describe the equations used to quantify exposure, which will be summarized in tables.

4.3.3 Exposure Parameters

- describe the equations used to quantify exposure, which will be summarized in tables.

4.3.4 Absorption and Bioavailability

- describe assumptions regarding absorption and bioavailability. Information will be summarized in tables.

5.0 TOXICITY ASSESSMENT

- summarize the toxicity criteria to be used in the HHRA, including references.

5.1 NONCARCINOGENIC HEALTH EFFECTS

- summarize non-cancer toxicity criteria will be described and summarized in tables.

5.2 Carcinogenic Health Effects

- summarize carcinogenic toxicity criteria will be described and summarized in tables.

5.3 EVALUATION OF LEAD

- evaluate lead for non-cancer health effects will be summarized.

6.0 RISK CHARACTERIZATION

- combine the exposure and toxicity assessment to quantify risk in this section.

6.1 NONCARCINOGENIC HEALTH EFFECTS

- present the methods for assessing noncarcinogenic health effects.

6.2 CARCINOGENIC HEALTH EFFECTS

- present the methods for assessing carcinogenic health effects.

6.3 HEALTH EFFECTS FROM LEAD

- present the methods for assessing potential noncancer health effects from lead exposure.

6.4 SUMMARY OF RISK CHARACTERIZATION

- present the results of the risk assessment for each receptor as appropriate to each data evaluation unit and study area. Tables summarizing the risk characterization will be presented with a comparison of on-property and off-property risk estimates to reference area risk estimates. Figures may be used to demonstrate the results.

6.5 UNCERTAINTIES AND LIMITATIONS IN RISK ASSESSMENT

- summarize the uncertainties and limitations in the HHRA. A qualitative discussion and semi-quantitative tabular summary will be presented.

7.0 CONCLUSIONS

- summarize the conclusions of the HHRA.

8.0 REFERENCES

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ATTACHMENT D

Annotated Table of Content for Ecological Risk Assessment, Volume 3

DRAFT
ANNOTATED TABLE OF CONTENTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT
VOLUME 3: ECOLOGICAL RISK ASSESSMENT

Leviathan Mine Site
Alpine County, California

EXECUTIVE SUMMARY

1.0 INTRODUCTION

1.1 PURPOSE OF ECOLOGICAL RISK ASSESSMENT IN THE CERCLA RI/FS PROCESS

- describe purpose of ERA, typical components per EPA ERA guidance, required components per Statement of Work

1.2 REPORT ORGANIZATION

- outline key sections of ERA Report and summarize contents of each key section

1.3 REGULATORY GUIDANCE

- this section will list the main regulatory guidance documents used to develop the baseline ecological risk assessment (ERA)

2.0 SITE BACKGROUND AND REGIONAL SETTING

2.1 SITE BACKGROUND

- this section will be obtained from the RI. It will describe site background including CERCLA definition of the site and site history. It will included a figure showing the mine site

2.1.1 Site Description

2.1.2 Site History

2.2 REGIONAL SETTING

- this section will be obtained from the RI. The following subsections will provide a summary of generalized regional conditions based on information available prior to the implementation of FRIs

2.2.1 Demography and Land Use

2.2.2 Climate

2.2.3 Surface Features and Topography

2.2.4 Geology

2.2.5 Hydrogeology

2.2.6 Habitat and Biota Description

3.0 DATA EVALUATION

- Data evaluation will be discussed by media and then study area. Available data will be identified, and the rationale for selecting data for the risk assessment will be presented. This section will rely on the RI for much of this information. On-, off-property and reference data sets will be evaluated within each section. COPEC concentrations within study areas will be compared to appropriate reference concentrations and the spatial variability in COPEC concentrations will be evaluated. If there is significant variation in COPEC concentrations within a study area, the study area may be subdivided into discrete data evaluation units for consideration in the ERA. Detailed summaries of the

data evaluation will be presented in appendixes to the risk assessment. Each subsection will address data usability, data adequacy, and COPEC selection. Usable data will be summarized and statistical summaries will be presented in tables for each media within each study area or data evaluation unit. This section will refer to the RI report as appropriate for this information.

3.1 SURFACE WATER

3.2 STREAM SEDIMENT

3.3 FLOODPLAIN SOIL

3.4 FISH TISSUE

3.5 PLANTS

3.6 MINE WASTE/OVERBURDEN

3.7 RIVER RANCH SOIL

- This section may only present a screening evaluation if area meets screening criteria.

3.8 SUSPECTED ORE PILES

- This section may only present a screening evaluation if area meets screening criteria.

3.9 LEVIATHAN MINE ROAD

- This section may only present a screening evaluation if area meets screening criteria.

3.10 EAST FORK CARSON RIVER

- This section may only present a screening evaluation if area meets screening criteria.

4.0 EXPOSURE ASSESSMENT

4.1 ECOLOGICAL RECEPTORS

- the following subsections will describe the selection of ecological receptors, exposure pathways, calculation of exposure point concentrations, calculation of exposure dose, and exposure scenarios

4.1.1 Terrestrial Receptors

- describe the selection of terrestrial receptors and their habitat preferences

4.1.2 Aquatic Receptors

- describe the selection of aquatic receptors and their habitat preferences

4.2 EXPOSURE PATHWAYS

- describe potential exposure pathways and pathways considered to be complete

4.2.1 Sources, Mechanisms of Release, and Mechanisms of Transport

4.2.2 Exposure Points, Routes, and Pathways

4.2.3 Complete Exposure Pathways

4.3 EXPOSURE POINT CONCENTRATIONS

- Description of how EPCs were calculated and presentation of the results for the different media being evaluated (soil, sediment, water, plants, fish, and small mammals). Compare EPCs for study areas to appropriate reference concentrations.

4.4 EXPOSURE DOSE CALCULATION

- Description of equations and exposure parameters used to calculate COPEC dose for ecological receptors

4.5 EXPOSURE SCENARIOS

- Description of exposure scenarios for each ecological receptor evaluated in the ERA

5.0 TOXICITY ASSESSMENT

- Description of the dose-based toxicity reference values (TRVs) and concentration-based TRVs used in the ERA

5.1 DOSE-BASED TRVS

5.2 CONCENTRATION-BASED TRVS

- Will be used for terrestrial plant and soil invertebrate community and aquatic plant and benthic communities

6.0 RISK CHARACTERIZATION

- Presentation of the risk screening results and calculation of risk for all receptor categories. Tables summarizing the risk characterization will be presented with a comparison of on-property and off-property risk estimates to reference area risk estimates.

6.1 SCREENING ASSESSMENT

- This section will come from the RI. Presentation of COPECs that do and do not exceed media-specific screening values

6.2 PLANT COMMUNITY

- Presentation of Plant Community HQ values

6.1.1 Terrestrial Plants

6.1.2 Aquatic Plants

6.2 SOIL INVERTEBRATE COMMUNITY

- Presentation of Soil Invertebrate Community HQ values

6.3 BENTHIC INVERTEBRATE COMMUNITY

- Presentation of Benthic Invertebrate Community HQ values

6.4 TERRESTRIAL WILDLIFE

- Presentation of HQ values for birds, mammals and reptiles

6.5 AQUATIC RECEPTPRS

- Presentation of HQ values for amphibians and fish

7.0 UNCERTAINTY ANALYSIS

7.1 EXPOSURE ASSESSMENT UNCERTAINTIES

- Discussion of uncertainties associated with the exposure assessment

7.1.1 Pathways Not Evaluated

7.1.2 Exposure Point Concentration Values

7.1.3 Receptor Exposure Factors

7.1.4 COPEC Bioavailability

7.2 TOXICITY ASSESSMENT UNCERTAINTIES
- Discussion of uncertainties associated with the toxicity assessment

7.2.1 Representativeness of Receptors Evaluated

7.2.2 Extrapolation of Toxicity Data Between Receptors

7.2.3 Extrapolation of Toxicity Data Across Dose or Exposure Duration

7.2.4 Extrapolation of Toxicity Data From Laboratory to Field Conditions

7.2.4 Chemical Synergism and Antagonism

7.3 RISK CHARACTERIZATION UNCERTAINTIES
- Discussion of overall conclusions regarding uncertainty associated with risk estimates presented in the ERA

8.0 CONCLUSIONS
- Summary of the main conclusions of the ERA

9.0 REFERENCES

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Annotated Table of Content for Feasibility Study, Volume 4

DRAFT
ANNOTATED TABLE OF CONTENTS
REMEDIAL INVESTIGATION / FEASIBILITY STUDY REPORT
VOLUME 4: FEASIBILITY STUDY

Leviathan Mine Site
Alpine County, California

EXECUTIVE SUMMARY

1.0 INTRODUCTION

1.1 PURPOSE OF FEASIBILITY STUDY

- Describe purpose of FS, typical components per EPA RI/FS guidance, required components per UAO Statement of Work

1.2 REPORT ORGANIZATION

- Describe key sections of FS Report and summarize contents of each key section

1.3 REGULATORY GUIDANCE

- List the main regulatory documents used to develop the feasibility study

2.0 SITE BACKGROUND AND REGIONAL SETTING

2.1 SITE BACKGROUND

- Describe site background including CERCLA definition of site and site history – including mining era and post-mining era

2.1.1 Site Description

2.1.2 Site History

2.2 REGIONAL SETTING

- The following subsections will provide a summary of generalized regional conditions based on information available prior to the implementation of FRIs

2.2.1 Demography and Land Use

2.2.2 Climate

2.2.3 Surface Features and Topography

2.2.4 Geology

2.2.5 Hydrogeology

2.2.6 Ecology

3.0 CONCEPTUAL SITE MODEL

- For RI purposes, the site was divided into study areas. Environmental media occur in multiple study areas. The FS is organized primarily by environmental media, and secondarily by study area.

3.1 SITE PHYSICAL FEATURES

- Description of features that are relevant to the FS. For each one, refer to RI section for more detail.
  - Mineralized ore/rock body near the pit
  - Pit, PUD, Underground Workings, Adit 5 portal, USFS road near the pit
  - Other mining-related infrastructure
  - Mine Waste – definition, location

- Overburden – definition, location
- Leviathan Basin landslide
- Delta Slide
- Ponds – focus on ponds that either (a) require rehabilitation (based on geotech evaluation), or (b) will be modified as part of remedial alternative (such as increasing volume)
- Lined channel, CUD/Delta Seep
- Existing Infrastructure – HDS, PWTS, ASBR
- LM Road
- Suspected Ore Piles
- River Ranch

3.2 PHYSICAL HAZARDS

- List the physical hazards associated with the site that are addressed or relevant to remedial alternatives evaluated in the FS
  - Pit highwall and adjacent USFS road
  - Mining infrastructure (ore loading facility)
  - Unstable ground at Leviathan Basin landslide – the main hazard is the effect of ground movement on infrastructure
  - Any other physical hazards identified in the RI

3.3 SITE HYDROLOGY

- Summary of groundwater and surface water flow system in on-property and off-property areas, and acid drainage features (PUD, Adit 5, CUD, Delta Seep, Aspen Seep). This is a high-level overview, and summarizes the site water budget.

3.4 SOURCE MATERIALS

- Describe the materials that are the ultimate source of acidic drainage Describe how the process of mining removed sulfur ore, left sulfide-bearing rocks in place; disposed low-grade ore and sulfide bearing rocks as mine waste; and disposed largely barren soil/rock as overburden. Compare concentrations of sulfur, sulfide minerals, and concentrations of metals and metalloids in these media. Describe the location of each type. Refer to RI for more detail

3.4.1 Mineralized Rock

3.4.2 Mine Waste

3.4.3 Overburden

3.5 CONTAMINANT FATE AND TRANSPORT

- This section is a narrative description of the major COC transport mechanisms that are important at/near the site. The objective is to summarize the CSM for how the N&E of contamination described in preceding section came to be.
- Describe how COCs originate in source rocks; are converted to the aqueous phase via pyrite oxidation; are transported in groundwater, ultimately reach surface water, and flow off-site.
- Also describe erosion/transport/deposition of stream sediment and floodplain soil, and deposition of chemical precipitates in stream.
- Describe the role of Leviathan Basin Landslide and Delta Slide in moving soil/rock into Leviathan Creek.

- Describe other contaminant transport processes, as appropriate based on RI results

3.5.1 Sulfide Oxidation and Generation of Acid Rock Drainage

- High level description of pyrite oxidation producing ARD as the overarching geochemical conceptual model. This section is a description of the chemical process in general

3.5.2 Mineralized Rock, Mine Waste, Overburden, and Terrestrial Soil

- This section ties the pyrite oxidation conceptual model to site conditions, particularly N&E described in the next section.
- Also describe that mass movement at landslides moves waste rock and overburden into streams

3.5.3 Groundwater and Acidic Drainage

- Groundwater is the transport pathway from rocks (in situ, mine waste, overburden, terrestrial soil) to surface water. Discharge at discrete features (PUD, Adit 5, Delta Seep, Aspen Seep, CUD), and potentially to stream (pending RI results) introduces dissolved COCs to surface water.

3.5.4 Surface Water, Stormwater, and Snowmelt

- - Surface water is transport mechanism for dissolved COCs and sediment. Stormwater and snowmelt are transport mechanisms for both dissolved COCs and sediment to on-site surface water.

3.5.5 Stream Sediment and Floodplain Soil

- Alluvial material and chemical precipitates transported to and deposited in riparian areas.

3.5.6 Biota

- Biota can take up COCs and provide exposure pathways for eco and human receptors. Plants can take up COCs from root zone soil (terrestrial) and/or water column (aquatic). Fish and benthic organisms can take up COCs from water column, sediment, food. All could, in theory, be pathways to eco or human receptors

3.5.7 Air

- Fugitive dust from on-site terrestrial soil is the relevant transport mechanism.

3.6 Nature and Extent of Contamination

- Summarize nature and extent of contamination in each medium, and refer to RI report for more detailed information

3.6.1 Mineralized Rock, Mine Waste, Overburden, and Terrestrial Soil

- Refer to previous section for lateral and vertical extent of the materials. This section focuses on the geochemistry (i.e. COC concentrations) in each material. This is a summary, refer to RI for more detail. This will provide basis for identifying material types and specific areas that are more important as sources of COCs.

3.6.2 Groundwater and Acidic Discharge

- Summarize N&E of contamination in groundwater, and discharge of contaminated groundwater on-site at Adit 5, PUD, Aspen Seep, Delta Seep, and CUD (ARD Discharge)

3.6.3 Surface Water, Stormwater Runoff, and Snowmelt Runoff

- Summarize N&E of contamination in these media.

3.6.4 Stream Sediment and Floodplain Soil

- Summarize N&E of contamination in these media.

3.6.5 Biota

- Summarize N&E of contamination in these media (plant tissue, fish tissue, benthic organisms).

3.6.6 Air

- Explain approach taken in the RI to address this medium.

3.7 BASELINE RISK ASSESSMENT SUMMARY

- Summarize the RA findings with respect to complete exposure pathways and the COCs and COECs in each media. Summarize here, refer to the HHRA and ERA reports for more details. Identify the media-specific COCs that exceed HH or eco risk.

3.7.1 Potential Exposure Pathways

3.7.2 Human Health Risk Assessment

3.7.3 Ecological Risk Assessment

4.0 DEVELOPMENT OF PRELIMINARY REMEDIATION GOALS

4.1 REMEDIAL ACTION OBJECTIVES

4.1.1 General RAOs

- Describe the overarching RAOs

4.1.2 Specific RAOs

- Describe the media-specific RAOs

4.1.2.1 Physical Hazards

4.1.2.2 Mine Waste, Overburden, and Terrestrial Soil

4.1.2.3 Groundwater and Acidic Discharge

4.1.2.4 Surface Water, Stormwater, and Snowmelt

4.1.2.5 Stream Sediment and Floodplain Soil

4.2 POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) AND TO BE CONSIDERED (TBC) GUIDANCE

- Summarize the ARARs and TBCs, and refer to appendix for more detail

4.2.1 Potential Chemical-Specific ARARs and TBCs

- For all constituents observed at site

4.2.2 Potential Location-Specific ARARs and TBCs

- ARARs tied to locations, such as wetlands or NHPA-significant areas

4.2.3 Potential Action-Specific ARARs and TBCs

- Pending identification of remedial alternatives

4.3 SITE-SPECIFIC PRELIMINARY CLEANUP GOALS

- Numerical goals by medium based on a synthesis of ARARs, risk-based calculations, and reference concentrations. This focuses on COCs and COECs

(which drive the site risks or which exceed established regulatory limits), not COPCs or COPECs (present at the site, but not significant risk drivers). "Preliminary" because finalization only occurs after everyone has concurred and it's documented in the approved ROD. The PCGs are developed in an appendix, and are summarized here. Although there are several potential sources for PCGs (ARARs, risk-based calculations, and reference concentrations), the goal of this section will be sort out all the numbers and derive a single cleanup goal for each COC/COEC.

4.3.1 Mine Waste, Overburden, and Terrestrial Soil

4.3.2 Groundwater and Acid Discharge

4.3.3 Surface Water, Stormwater, and Snowmelt

4.3.4 Stream Sediment and Floodplain Soil

4.4 PRELIMINARY IDENTIFICATION OF AREAS OR VOLUMES OF MEDIA TO BE ADDRESSED

- This section will be the synthesis of the CSM (nature and extent, site risks) and the cleanup goals (RAOs, ARARs, and risk-based cleanup goals) to identify what needs to be done at the site. This focuses the remainder of the document on what needs to be done. "Preliminary" because finalization only occurs after everyone has concurred and it's documented in the approved ROD. This section is a critical link between the RI and RA results, and the remedial actions that are considered in this FS.
- For each medium, describe the area/volume that exceeds the cleanup criterion for each COC/COEC.
- Cleanup criteria developed in Section 4.3 consider ARARs, risk-based concentrations, and reference area concentrations

4.4.1 Mine Waste, Overburden, and Terrestrial Soil

4.4.2 Groundwater and Acidic Discharge

4.4.3 Surface Water, Stormwater, and Snowmelt

4.4.4 Stream Sediment and Floodplain Soil

5.0 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGY TYPES AND PROCESS OPTIONS

5.1 INTRODUCTION

- Identify and screen applicable technologies. This starts with a list and screens out technologies/process options on the basis of effectiveness, implementability, and relative cost. Define these criteria here in the Introduction section. Goal is to have representative technologies for different media that can be combined into comprehensive alternatives in the following section.

5.2 GENERAL RESPONSE ACTIONS

- Identify a list of technologies, conduct initial screening, and end with a list of retained technologies

5.2.1 No Action

5.2.2 Institutional Controls

5.2.3 Containment

5.2.4 Ex-situ Treatment

5.2.5 In-situ Treatment

5.3 REMEDIAL TECHNOLOGY IDENTIFICATION AND SCREENING

- Identify a list of technologies, conduct initial screening, and end with a list of retained technologies. Initial screening in this section will be on the basis of implementability, effectiveness, and relative cost; definitions to be provided at the start of this section.

5.3.1 Physical Hazards

5.3.2 Mine Waste, Overburden, and Soil

5.3.3 Groundwater and Acidic Discharge

5.3.4 Surface Water, Stormwater, and Snowmelt

5.3.5 Stream Sediment and Floodplain Soil

6.0 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

6.1 INTRODUCTION

- Description of how alternatives are assembled, and then screened based on the implementability, effectiveness, and cost. Retain a subset for detailed evaluation in the next section

  The alternatives will be identified during FS execution.

6.2 ALTERNATIVE 1 – NO ACTION

- Description
  Screening Evaluation

6.3 ALTERNATIVES FOR PHYSICAL HAZARDS

- **Description**
  In Section 6, describe how the alternative would be used at a generic site. In Section 7, describe how it would be applied specifically at LMS.

  Evaluation
  In Section 6, conduct preliminary evaluation based on implementability, effectiveness, and cost. Screen out the lower-ranked alternatives, retain the higher-ranked ones for detailed evaluation in Section 7.

  Same pattern for other media.

6.4 ALTERNATIVES FOR MINE WASTE, OVERBURDEN, AND SOIL

6.5 ALTERNATIVES FOR GROUNDWATER AND ACIDIC DISCHARGE

6.6 ALTERNATIVES FOR SURFACE WATER, STORMWATER, AND SNOWMELT

6.7 ALTERNATIVES FOR STREAM SEDIMENT AND FLOODPLAIN SOIL

7.0 DETAILED ANALYSIS OF ALTERNATIVES

7.1 DEFINITION OF EVALUATION CRITERIA

- These are the 9 NCP criteria
  Overall Protection of Human Health and the Environment
  Compliance with ARARs
  Long-Term Effectiveness and Permanence
  Reduction of Toxicity, Mobility, or Volume Through Treatment
  Short-Term Effectiveness

Implementability
Cost

State Acceptance
State acceptance can be considered in the FS if the state provides input during the FS. If input is provided only afterwards, then this criterion will be addressed in the ROD.

Community Acceptance
Community acceptance is not addressed in the FS. Instead, it will be addressed in the ROD based on public comment on the Proposed Plan.

The heading is retained in the following sections with a similar statement – just as a reminder that we didn't forget the 9th NCP criterion.

7.2 ALTERNATIVE 1 – NO ACTION

- Description
  Evaluation

7.3 ALTERNATIVES FOR PHYSICAL HAZARDS

- **Description**
  In Section 7, describe how alternative it would be applied specifically at LMS.

  Evaluation
  Evaluate using the 9 NCP criteria. Use a quantitative ranking system.

  Same for other media

7.4 ALTERNATIVES FOR MINE WASTE, OVERBURDEN, AND TERRESTRIAL SOIL

7.5 ALTERNATIVES FOR GROUNDWATER AND ACIDIC DISCHARGE

7.6 ALTERNATIVES FOR SURFACE WATER, STORMWATER, AND SNOWMELT

7.7 ALTERNATIVES FOR STREAM SEDIMENT AND FLOODPLAIN SOIL

8.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

- Relatively short narrative in this section. Use a numerical ranking scheme in a table to compare the alternatives to each other

8.1 APPROACH

- Describe the comparison approach. All alternatives (except No Action) meet the threshold criteria (protectiveness and ARAR compliance); this section is a comparison based primarily on effectiveness, reduction via treatment, implementability, cost, and acceptability

8.2 COMPARATIVE ANALYSIS OF ALTERNATIVES FOR PHYSICAL HAZARDS

- Each subsection includes a narrative description of the relative ranking basis, and a summary table of alternatives for that medium.

8.3 COMPARATIVE ANALYSIS OF ALTERNATIVES FOR MINE WASTE, OVERBURDEN, AND TERRESTRIAL SOIL

8.4 COMPARATIVE ANALYSIS OF ALTERNATIVES FOR GROUNDWATER AND ACIDIC DISCHARGE

8.5 COMPARATIVE ANALYSIS OF ALTERNATIVES FOR SURFACE WATER, STORMWATER, AND SNOWMELT

8.6 COMPARATIVE ANALYSIS OF ALTERNATIVES FOR STREAM SEDIMENT AND FLOODPLAIN SOIL

9.0 PREFERRED ALTERNATIVE

9.1 INTRODUCTION

- In contrast to the typical FS approach in which a preferred alternative is not identified, the UAO for RI/FS requires that the FS identify the preferred alternative.

  UAO (2008) Attachment 1, Statement of Work, page 15. II.
  The Feasibility Study shall include… D. Recommendation of a preferred remedial action plan for EPA approval.

  The preferred alternative described here will include RA components for each medium and site area where remediation is needed, based on cleanup criteria established in Section 4.

9.2 DESCRIPTION OF THE RECOMMENDED ALTERNATIVE

- Narrative description of the preferred alternative that includes RAs for some/all media, and some/all areas.

9.2.1 Recommended Alternative for Physical Hazards

9.2.2 Recommended Alternative for In Situ Mineralized Rock

9.2.3 Recommended Alternative for Mine Waste, Overburden, and Terrestrial Soil

9.2.4 Recommended Alternative for Groundwater and Acidic Discharge

9.2.5 Recommended Alternative for Surface Water, Stormwater, and Snowmelt

9.2.6 Recommended Alternative for Stream Sediment and Floodplain Soil

10.0 REFERENCES

TABLES

To Be Determined

FIGURES

To Be Determined

APPENDICES

A – ARAR AND TBC IDENTIFICATION
B – RISK-BASED CLEANUP GOALS DEVELOPMENT
C - REMEDIAL ALTERNATIVE COST ESTIMATES